The role of AI for Impact in the fight against COVID-19

Mobile Big Data Solutions to support decision makers

May 2020

The role of mobile networks in the fight against COVID-19

It is difficult to overstate the impact of the COVID-19 pandemic on families, industries, and governments across the globe. The disease has caused widespread illness and enormous disruption to many aspects of modern life. As the physical economy became disrupted, digital and telecommunications infrastructure has become even more indispensable, helping people all over the world stay connected and active in their personal and professional lives. Mobile network operators continue to provide resilient connectivity to billions of customers in the face of surging demand, but they are also finding other ways to contribute to the fight against the disease.

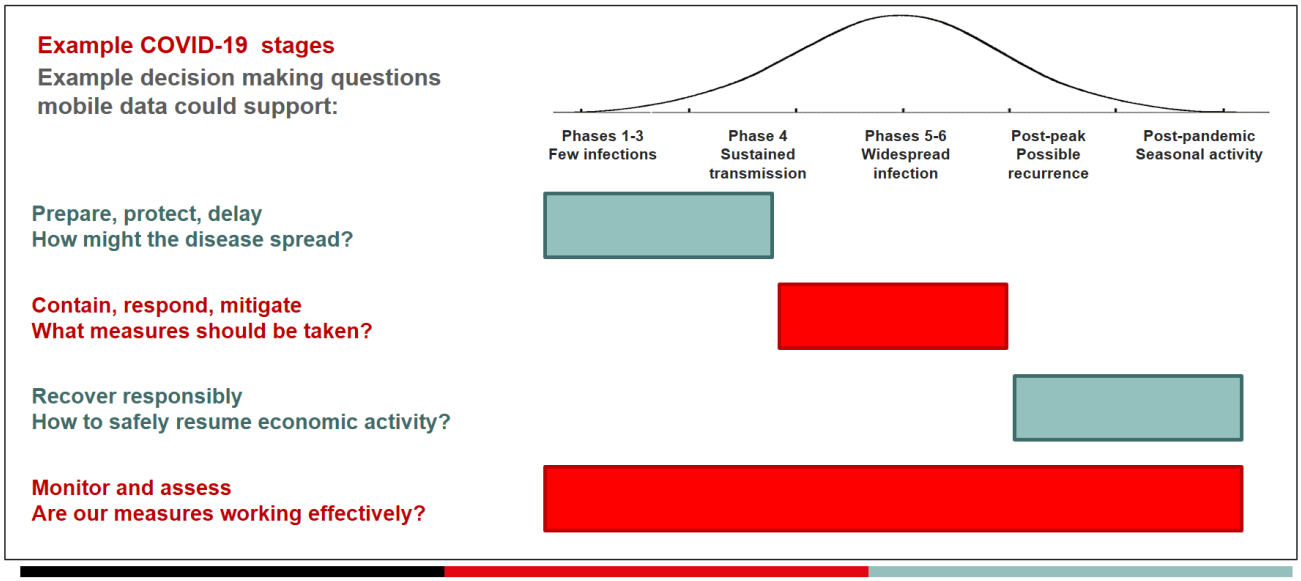
Telehealth and telemedicine have become valuable tools, allowing doctors to offer diagnostics and treatment advice remotely and to share experience with one another. Education has gone remote too, and operators are helping pupils reach the materials they need to continue their learning. And just as governments and health authorities are relying on mobile network technology to relay important public information, the data processing and analytics capabilities of operators can provide decision-makers with essential insights too.

Analytics to support decision-makers

Our movement patterns and habits have changed vastly over the last few months in response to work from home directives, travel restrictions, lockdowns, and other social distancing measures. Knowledge of the details of these patterns in aggregate, on the scale of whole countries, can help governments to make informed decisions about how best to control the spread of the disease and limit its impact.

In the early stages, aggregated mobility data can be used in epidemiological models that reveal how a disease is behaving and how quickly it is spreading to help identify transmission hotspots or sources of infection. Similar models can later indicate where the disease is likely to spread to next. Through up-to-date information on population density, logistical decisions can be improved, optimising the placement of resources like personal protection equipment and ventilators or even new facilities. The right time to implement social distancing measures, which are in themselves challenging for many parts of the economy and society, needs to be selected based on a detailed understanding of how the population currently behaves, and which communities will be most disrupted. Monitoring the impact of policies and directives on actual behaviour can help to determine whether messaging is effective or needs to be strengthened.

Looking past the peak of infections, decisions about how to relax movement restrictions, where, when, and in what order, need to be taken carefully. The economic recovery can be better managed if governments can assess the cost-benefit balance of different types of interventions. This can be helped by analysis of the contributions of different types of movement to infection rates. Communities, regions, and industries that are disproportionately impacted can be identified and supported.

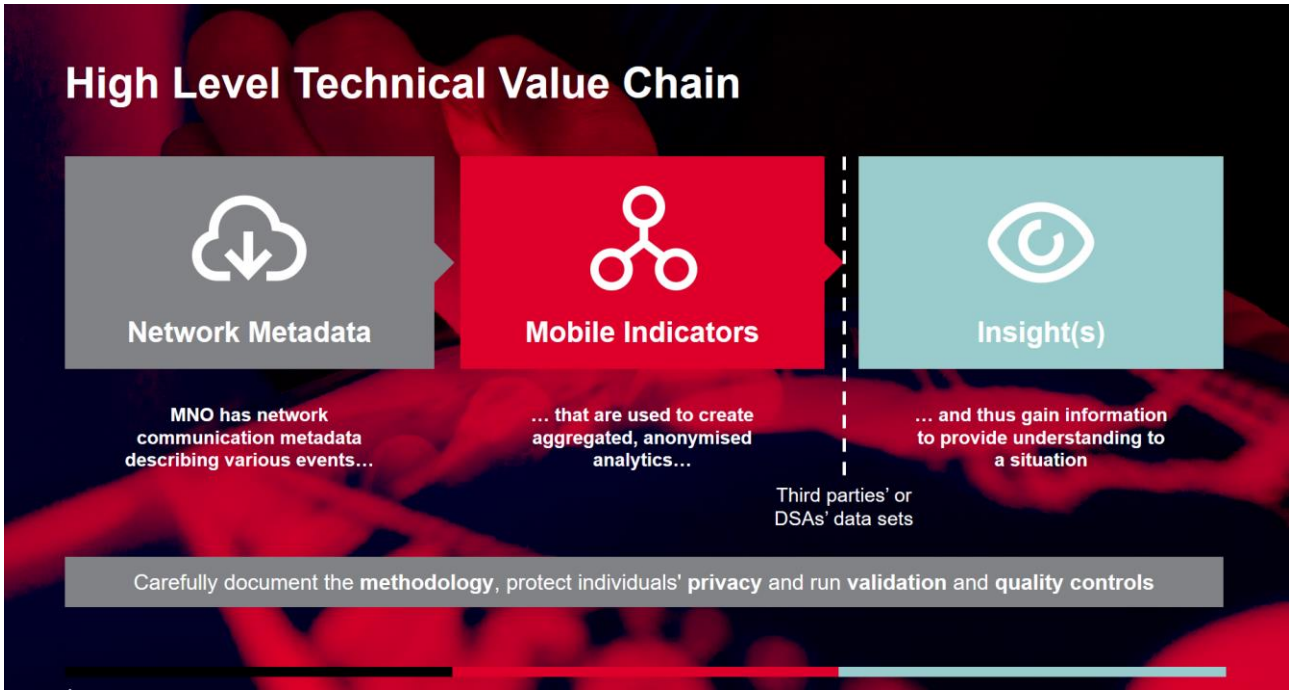


Source: GSMA. How Mobile aggregates can help to answer key questions at every stage of the crisis. Pandemic phases are taken from the WHO's Pandemic Influenza Phases (2009)[1]

[1] https://www.ncbi.nlm.nih.gov/books/NBK143061/

How mobile data is processed

Operating a mobile network generates a huge amount of data. Broadly, this can be divided into three types. The first is about the structure and status of the network itself: the locations of cell towers, the operational status of each network component and the amount of traffic passing through it. The second is customer relationship management data. This might include sociodemographic segment data, like age bracket, gender, or some category indicating the type of products and services the customer is likely to be interested in. The third and most unique broad data type is event data. Event data records information about interactions between devices and the network, including calls, SMS and data traffic (rather than data content), and sometimes signalling switches used by the network to route traffic to reach a specific device. Event data includes call description records (CDRs) and is sometimes referred to as metadata because it contains information about network traffic patterns, not the traffic itself. Events relate a SIM card to a cell tower at a specific time.



These data types can be combined and processed to yield useful insights without compromising privacy. The first step is to remove any information that could directly identify the customer, such as names or phone numbers. This dissociates the data from any individual, but still allows it to be used for analysis. The data is then cleansed and filtered, tidying it up ready for analysis. This is an involved and detailed process. For example, unwanted records, such as those from machine connections, inactive or immobile SIMs, or IoT devices, are removed, and the time of an event might be simplified, from a millisecond timestamp to a 15 minute, 1 hour, or 1 day window, to condense the data and smooth out irregular signals. The dissociated, processed data is then aggregated over regions or time periods to produce valuable insights while mitigating privacy risks. Aggregation further reduces the likelihood of re-identification of any specific individual.

Aggregated data yields insights

Over the course of the COVID-19 crisis so far, the GSMA has been working closely with operators and demand-side agencies to understand how mobile big data analytics can support governments. We have seen four main types of data aggregates used to build insights to combat the virus and improve the response, easing the impact on citizens' lives.

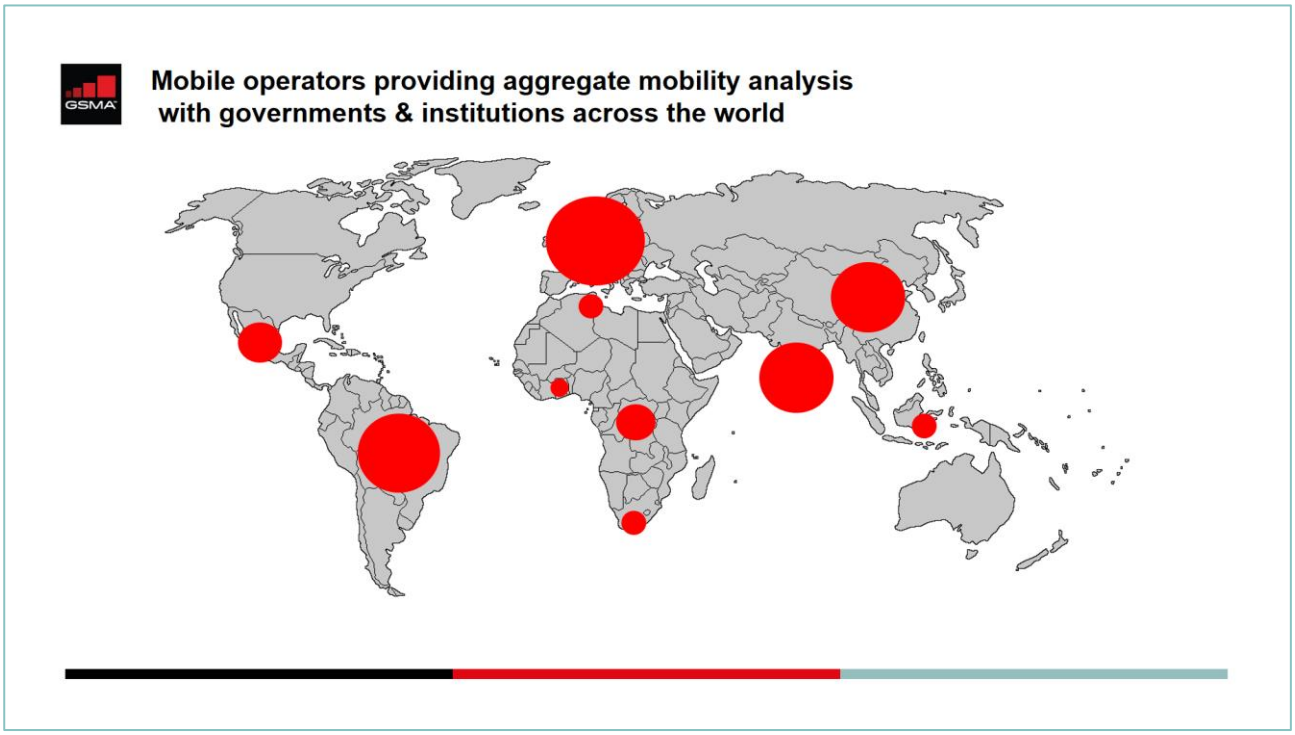
First, aggregate measures of network traffic can reveal the volume of calls to helplines or emergency services numbers. This can act as a proxy for public sentiment, the likely pressure on health services, or where potential cases might be on the rise. Second, population maps give the total number of people present in a region at a specific time, which can be updated regularly to give a recent and dynamic picture of population density. This is useful for resource planning, identifying potential transmission hotspots, or informing lockdown policies and exit strategies.

Third, origin-destination (OD) matrices show the volume of movement between locations or regions. This might be as a proportion of the population in the origin or destination, or relative to a previous time period, to allow more meaningful analysis. OD matrices are used to build network models that predict the spread of infection, monitor the impact of travel restrictions over larger distances, and understand how people might have been displaced by the crisis.

Fourth and finally, mobility measures indicate the average level of mobility in a region or group. This can be calculated in a number of ways. For example, the average number of cell towers visited by people living in an area, the number of trips made to a work or non-work destination, or the percentage of time spent away from home. These measures are useful for monitoring the impact of, and level of adherence to, movement restrictions, as well as for deciding when and how to relax them. Some of these measures are novel, developed specifically to meet the unique demands of the COVID-19 crisis. Operators have been able to apply their analytic capabilities to develop dedicated, specialist services, packaging these insights for governments and agencies to quickly assess the situation and make informed decisions.

Example collaborations

There are many examples of extraordinary collaborations between operators and governments all over the world in the face of this crisis.



Orange, Vodafone, and Telefonica are all working with the national statistics institute of Spain to help monitor the movements of people in and out of specific regions and away from normal home locations during working hours, to help predict the spread of the virus and monitor the impact of lockdown policies. All three operators are also working with many other governments in other parts of their footprint, covering most of Europe and many parts of South America and Africa.

Telenor has been working with the Norwegian Institute for Public Health since January, even before the first cases in Norway were reported, to help build epidemiological models.

Deutsche Telekom is collaborating with the Robert Koch Institute in Germany to build simulations of disease spread.

In Tunisia, ***Ooredoo*** has developed dashboards to display the number of calls to emergency services in each region, which they are sharing with the Ministry of ICT and the Ministry of Health.

These are just a few examples of what mobile operators are doing. The GSMA AI for Impact initiative is working with its global Taskforce of 21 mobile operators and Advisory Panel of UN agencies and partners to continuously track projects, capture lessons learned and share knowledge. It further coordinates new cross-sector collaborations and promotes privacy and ethical principles to guide the work.

Challenges ahead

Producing these valuable insights on demand in very short timescales is not without its challenges. A number of factors are key to success. This includes the level of knowledge and experience of governments leveraging insights from mobile big data analytics into planning and decision-making processes. Further, it is essential consumer privacy be respected and protected throughout the process. The GSMA COVID-19 Privacy Guidelines provide guidance on how to preserve privacy while helping governments and public health agencies in the fight against COVID-19. There are also technical challenges. Computing infrastructure and data processing pipelines need to be set up and secured; relationships need to be established, and the specific insights need to be identified and computed. All of these steps require resources and funding.

For now, operators and governments are focused on tackling the immediate needs to address this global emergency. But there is one eye on the future, looking to ensure resilient solutions and coordination mechanisms are in place to respond to future crises and be better prepared.

Resources

GSMA AI for Impact Digital Toolkit

The GSMA AI for Impact digital toolkit provides a comprehensive guide to the key components needed to implement mobile data driven solutions.

https://aiforimpacttoolkit.gsma.com/

GSMA Mobile Privacy Guidelines

These guidelines reflect recommendations on how the mobile industry may maintain trust while responding to those governments and public health agencies that have sought assistance in the fight against COVID-19.

https://www.gsma.com/publicpolicy/resources/covid-19-privacy-guidelines

GSMA HEAD OFFICE
Floor 2
The Walbrook Building
25 Walbrook
London
EC4N 8AF
United Kingdom
www.gsma.com